

REMARKS/ARGUMENTS

Claims Status

Claims 9-18 are pending, not currently amended, and as filed on February 26, 2009.

Supplemental Remarks Concerning the §102(b)/§103(a) Rejection in view of *Kagohashi*

Claims 1-5 and 7-9 are rejected under 35 U.S.C. §102(b) as anticipated by or, in the alternative, under 35 U.S.C. §103(a) as obvious in view of *Kagohashi* (JP 2001-151510).

Applicants respectfully traverse this rejection as it applies to pending claim 9 (claims 1-5, 7 and 8 being canceled).

The claimed invention relates to a method for producing an anatase-type titanium oxide powder. The method comprises (i) preheating titanium tetrachloride, oxygen gas, hydrogen gas, and steam at 450 to 600°C and (ii) reacting the preheated titanium tetrachloride, oxygen gas, hydrogen gas, and steam in a gaseous phase, wherein the amounts of oxygen gas, hydrogen gas, and steam supplied are respectively 60 to 90 liter, 60 to 90 liter, and 240 to 400 liter per 1 liter of titanium tetrachloride gas (see independent claim 9).

Applicants previously argued that:

The Office admits that “Kagohashi et al. differ from the instant invention in that the preheating temperature overlaps and/or lies within the instantly claimed range” (Office Action, page 8, first full paragraph) and “Kagohashi et al. differ from the instant invention in that the amounts of oxygen gas, hydrogen gas, and steam differ from the instant invention” (Office Action, page 8, third full paragraph). However, the Office concludes that a *prima facie* case of obviousness exists with respect to *Kagohashi* due to the overlapping ranges as supported by *In re Wertheim*, *In re Woodruff* and *In re Peterson*.

Applicants note that M.P.E.P. 2144.05 (III) states:

“Applicants can rebut a *prima facie* case of obviousness based on overlapping ranges by showing the criticality of the claimed range.

‘The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims.’ ...” (emphasis added).

Accordingly, Applicants now refer the Examiner to the Declaration Under 37 C.F.R. §1.132 executed by Mr. Sakai submitted herewith demonstrating the criticality of the claimed preheating temperature and the claimed amounts of hydrogen, oxygen and steam.

More specifically, paragraph 4 of the Sakai Declaration (provided below) describes how the Supplemental Experimental Examples 1-4 were produce and analyzed as compared to Examples 1-3 and Comparative Examples 1-3 of the original specification.

4. The original specification includes Examples 1-3 and Comparative Examples 1-3. These examples were produced and analyzed according to the description on page 8, line 11, to page 14, line 8. In order to provide comparisons with the Examples and Comparative Examples of the original specification, the following Supplemental Experimental Examples 1-4 were produced and analyzed as described on page 8, line 11, to page 14, line 8. The following tables include original Example 1-3 and original Comparative Examples 1-3 as well as the new Supplemental Experimental Examples 1-4.

Process Conditions

	Claim	Example			Comparative Example			Supplemental Experimental Example			
		1	2	3	1	2	3	1	2	3	4
Preheating temperature (°C)	450-600°C	500	←	←	←	800	400	600	600	500	500
TiCl ₄ feed rate (L/min)	-	0.5	←	←	←	←	←	0.5	0.5	0.5	0.5
H ₂ feed rate (L/min)	-	40	←	←	95	40	20	40	40	30	40
Amount of H ₂ per 1 L of TiCl ₄ (L)	60-90L	80	←	←	190	80	40	80	80	60	80
O ₂ feed rate (L/min)	-	40	←	←	95	40	20	40	40	30	40
Amount of O ₂ per 1 L of TiCl ₄ (L)	60-90L	80	←	←	190	80	40	80	80	60	80
Steam feed rate (L/min)	-	130	200	300	350	130	110	150	200	130	130
Amount of steam per 1 L of TiCl ₄ (L)	240-400L	260	400	600	700	260	220	300	400	260	260
Reaction temperature (°C)	-	600	←	←	←	←	←	600	600	600	500

Product (titanium dioxide powder) Properties

	Example			Comparative Example			Supplemental Experimental Example			
	1	2	3	1	2	3	1	2	3	4
Average particle diameter (nm)	70	50	40	12	50	-	70	50	65	40
Rutile content (%)	4.6	2.2	4.2	8.6	92.2	-	8.0	5.0	4.0	3.4
Specific surface area (m ² /g)	26.0	33.3	42.4	86.2	30.5	-	23.0	28.0	30.0	25.0
D90	1.80	1.18	2.08	2.65	1.85	-	1.10	0.96	0.95	1.29
D50	0.60	0.44	0.41	0.40	0.54	-	0.47	0.33	0.30	0.49
D10	0.18	0.15	0.14	0.10	0.20	-	0.15	0.13	0.10	0.14
SPAN	2.7	4.9	4.7	6.4	3.1	-	2.0	2.5	2.8	2.3

Paragraph 5 of the Sakai Declaration (provided below) describes how Examples 1-2 and Supplemental Examples 1-4 (being examples within the claimed ranges for the

preheating temperature and amounts of O₂, H₂ and steam) include evidence of the criticality of these claimed parameters.

5. As can be seen from Examples 1 and 2 as well as Supplemental Experimental Examples 1-4, when an anatase-type titanium oxide powder is produced according to the claimed parameters (i.e., within the claimed ranges for the preheating temperature and amounts of O₂, H₂ and steam), titanium dioxide powders with controlled specific surface area (i.e., 23.0-33.3 m²/g) and low rutile content (i.e., 2.2-8.0%) were obtained.

Moreover, paragraph 6 of the Sakai Declaration (provided below) describes how Example 3 and Comparative Examples 1-3 (being examples outside the claimed ranges for the preheating temperature and amounts of O₂, H₂ and steam) include evidence of the criticality of these claimed parameters.

6. In contrast, Example 3 as well as Comparative Examples 1-3, which include preheating temperatures and amounts O₂, H₂ and steam outside the claimed ranges, result in either no titanium dioxide powder at all (i.e., Comparative Example 3) or titanium dioxide powders with a high rutile content (i.e., Comparative Example 2 - 92.2%) or an uncontrolled specific surface area (i.e., Example 3 and Comparative Example 1 - 42.4 and 86.2 m²/g respectively).

Lastly, paragraphs 7 and 8 of the Sakai Declaration (provided below) conclude that (i) the specific preheating temperature range, as well as specific amounts of hydrogen, oxygen and steam, of the claimed process are critical, and (ii) the properties exhibited by the claimed invention (e.g., controlled specific surface area and low rutile content) are both unpredictable and unexpected in view of the art.

7. The above comparisons between embodiments shows that the claimed preheating temperature and the claimed amounts of hydrogen, oxygen and steam are critical.

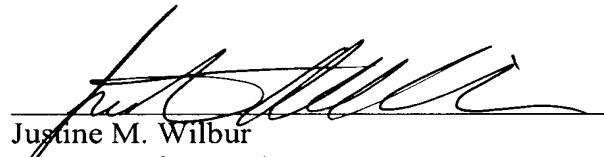
8. Furthermore, I believe that the properties exhibited by the claimed invention as discussed above (e.g., controlled specific surface area and low rutile content) are both unpredictable and unexpected in view of the art.

Accordingly, Applicants submit that the above provides an adequate showing of the criticality of the claimed ranges (i.e., preheating temperature and the amounts of hydrogen, oxygen and steam) pursuant to M.P.E.P. 2144.05 (III).

Thus, Applicants request withdrawal of the §102(b)/§103(a) rejection in view of *Kagohashi* as it is believed that the above showing of the criticality of the claimed ranges, as well as the unpredictable/unexpected nature of the obtained results, rebuts the *prima facie* case of obviousness as alleged by the Office.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

A handwritten signature in black ink, appearing to read 'Justine M. Wilbur', is written over a horizontal line.

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